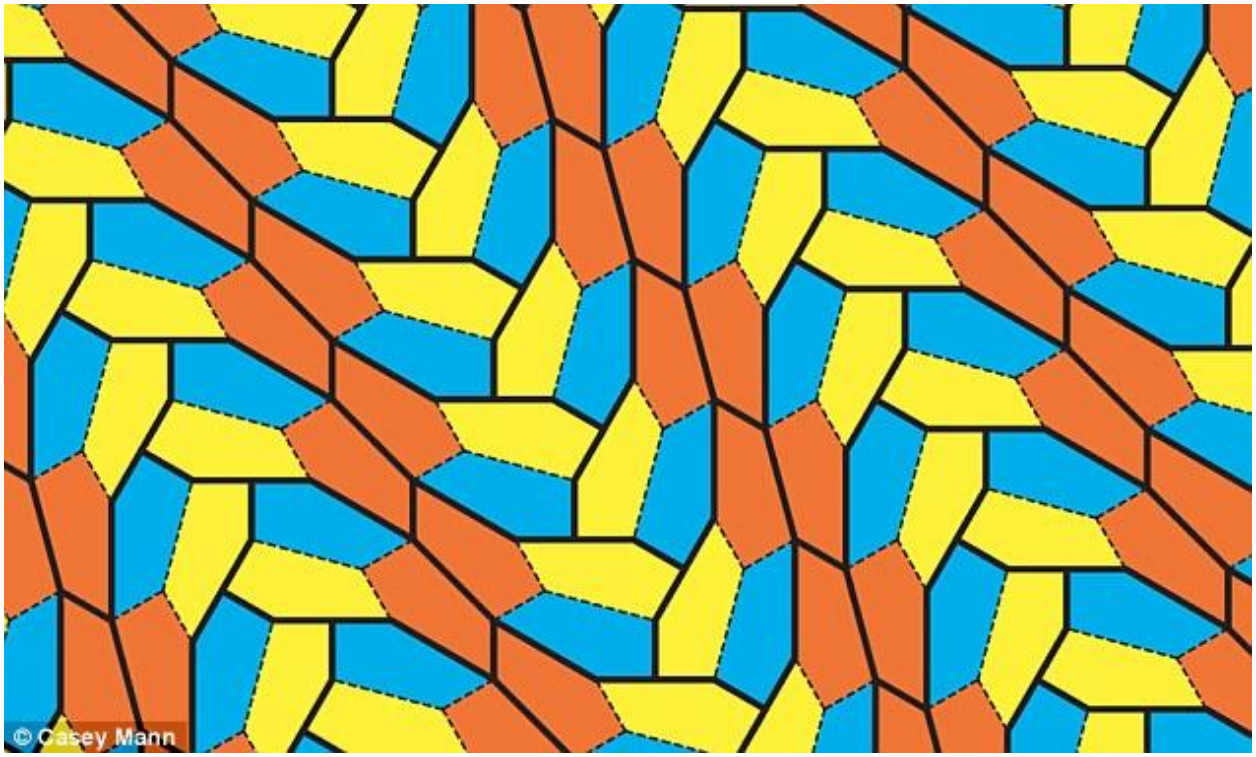
Mathematicians find new 'perfect shape' that solves one of their most complex problems

The pentagon can tile a floor without overlapping or leaving any gaps
It is only 15th type of non-regular pentagon discovered that can do this
In the maths world, team says it is similar to finding a new atomic particle

By ELLIE ZOLFAGHARIFARD FOR DAILYMAIL.COM
PUBLISHED: 16:01 EST, 17 August 2015

Tilers and bathroom designers now have a reason to rejoice.
Three scientists have made maths history by finding a new type of pentagon that can tile a floor without overlapping or leaving any gaps.
It's what researchers call 'tiling the plane' and their discovery is only the 15th type of non-regular pentagon that can do this, with the last one found 30 years ago.
The team said that for those in the maths world, finding this tile is analogous to finding a new atomic particle.



The discovery was made by researchers at Washington University using a computer program written by an undergraduate student.

The scientists included mathematics associate professor Casey Mann and his wife, Jennifer McLoud-Mann, along with undergraduate researcher David Von Derau.

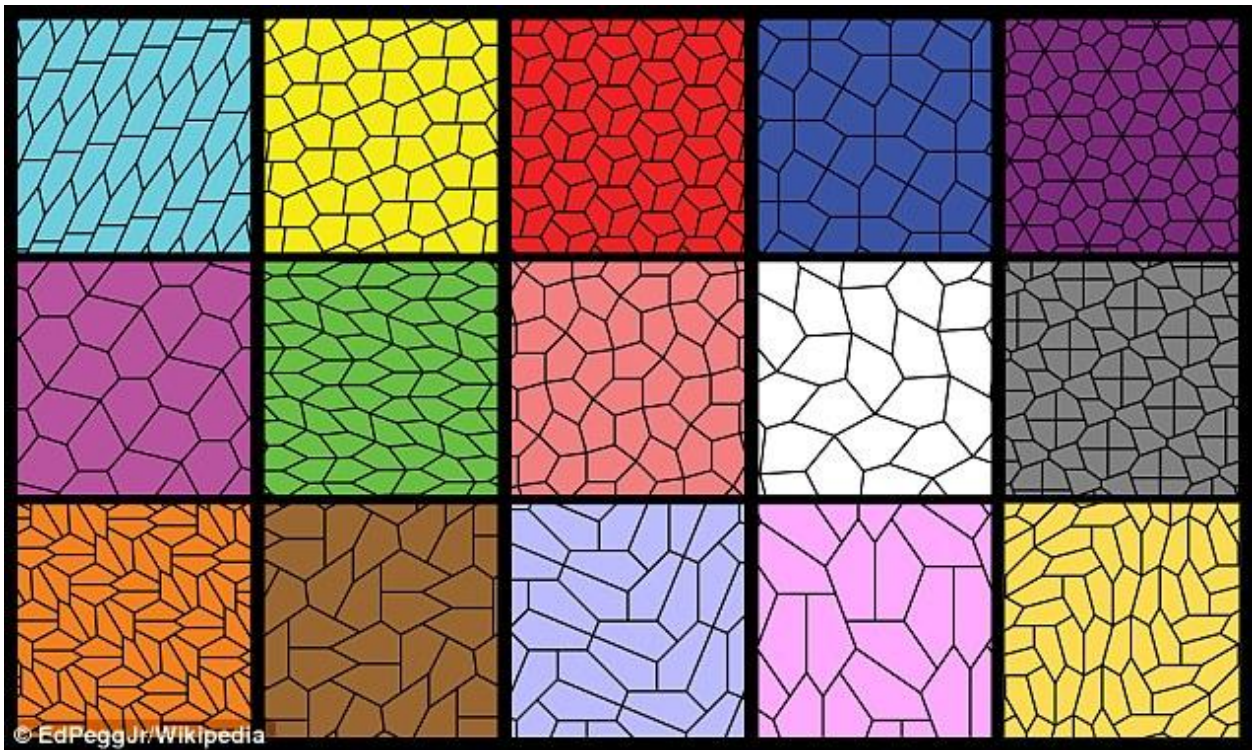
The research could also have practical uses in many areas, including biochemistry and structural design.

'Many structures that we see in nature, from crystals to viruses, are comprised of building blocks that are forced by geometry and other dynamics to fit together to form the larger scale structure,' Mann told the Guardian.

'Aside from the practical uses of this new knowledge, which would include a whole different way to tile a floor,' he added.

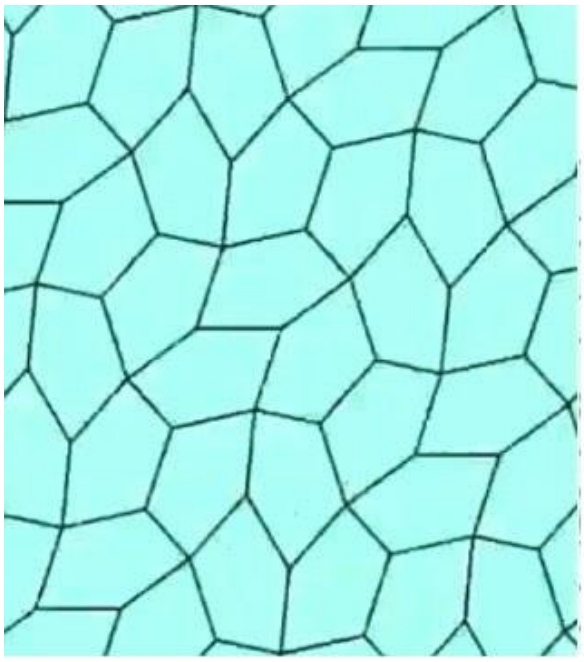
'The impact of this new tile moves us one step closer to having a complete understanding as to how shapes can fit together on a plane.'

While a triangle and a square can be tiled in limitless shapes and sizes, it is mathematically proven that convex polygons with more than six sides cannot.

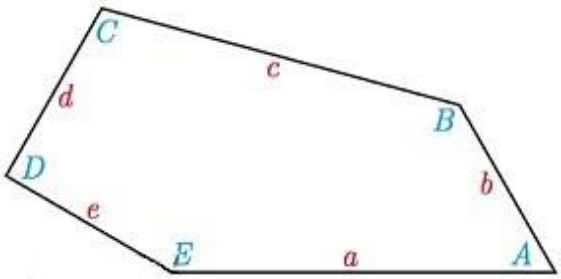


With the latest discovery, there are now 15 known convex pentagons, or non-regular pentagons with the angles pointing outward, that can 'tile the plane'

An example of how to Tile the Plane using abstract pentagons:



Tiling with a non-traditional pentagon is a challenge that many have accepted over the past century, but a few people have been successful.
A German mathematician discovered five pentagons that tile in 1918 and a San Diego housewife also discovered five. The latest 15th tile discovery is the first in 30 years.
Mann and McLoud-Mann specialise in tiling and knot theory and have been working on finding the new pentagon tile since their arrival at UW Bothell two years ago.
'It had gotten to the point, where we hadn't found anything,' McLoud-Mann told **NPR**. 'And I was starting to believe I just don't know if we're going to find anything.'
Last month, however, Von Derau's computer system created a number of intriguing possibilities which he sent to the researchers.
When they created a tiled picture of one of the pentagons, they realised they had unravelled on of maths' long-standing puzzles.
'I am too cautious to make predictions about whether or not more pentagon types will be found, but we have found no evidence preventing more from being found and are hopeful that we will see a few more,' Mann told **the Guardian.**



$$A = 60^\circ \qquad a = 1$$
$$B = 135^\circ \qquad b = 1/2$$
$$C = 105^\circ \qquad c = \frac{1}{\sqrt{2}(\sqrt{3}-1)}$$
$$D = 90^\circ \qquad d = 1/2$$
$$E = 150^\circ \qquad e = 1/2$$

Tiling with a non-traditional pentagon is a challenge that many have accepted over the past century, but a few people have been successful. Last month, however, Von Derau's computer system created a number of intriguing possibilities which he sent to the researchers. Pictured is the image of the 15th convex pentagon

SHAPES THAT CAN TILE A PLANE

While a triangle and a square can be tiled in limitless shapes and sizes, it is mathematically proven that convex polygons with more than six sides cannot. Tiling with a non-traditional pentagon is a challenge that many have accepted over the past century, but a few people have been successful.
A German mathematician discovered five pentagons that tile in 1918 and a San Diego housewife also discovered five. The latest 15th tile discovery is the first in 30 years